Val Bedretto (All' Acqua, 5265 feet).

The plants were exceedingly abundant in this part of the valley, both on the lower grass slopes and close to the stream; in both places the great majority belonged to the hairy type. Intermediates of the more hairy kind occurred here and there, generally in patches. The very smooth type was not common.

Val Canaria (Airolo, about 3900 feet).

Here the plants, which were only moderately abundant on the grass slopes, were all hairy.

Valley of the Rhone (at the foot of the glacier).

A few plants were growing on the shingle in the river bed, all very hairy.

Valley of the Rhone (Ulrichen, 4380 feet).

Only a very few plants were found, all very hairy.

Valley of the Rhone (Eginen Thal).

Plants numerous, both glabrous and hairy occurring together; a few of the hairier forms of intermediates were also found.

Val d'Anniviers and neighbourhood of Berisal (Simplon).

According to Mr. Bateson's observations in the preceding year Biscutella plants were abundant in both these localities; in the former all the plants were very hairy, in the latter the hairy type predominated, but some hairy intermediates were also found.

"Studies in the Morphology of Spore-producing Members. Part III. Marattiaceæ." By F. O. Bower, Sc.D., F.R.S., Regius Professor of Botany in the University of Glasgow. Received May 27,—Read June 17, 1897.

(Abstract.)

The memoir, of which this is an abstract, deals with the sori of all the four living genera of Marattiaceæ; the development has been traced in *Angiopteris* and *Marattia* from the earliest stages to maturity, in *Danæa* and *Kaulfussia* from such early condition as the material would permit. Some of the results from *Danæa* have been already submitted to the Society in a preliminary statement.* One result of the investigation has been to demonstrate, as regards their development, the substantial unity of type of the sporangia in the four genera. In all of them a single "superficial parent cell" of prismatic form is to be recognised embedded in the massive sporangium when young, not in a central position, but directed obliquely

* 'Roy. Soc. Proc.,' vol. 59, p. 141.

towards the centre of the sorus. By periclinal division this forms internally the archesporium, externally that part of the wall where dehiscence takes place. The tapetum arises, typically in them all, from the cells surrounding the archesporium. The dehiscence is in all by a slit in a radial plane, which may widen to a circular pore in *Danæa*. In those sori where the sporangia are united laterally there is no annulus; it is present only where the sporangia are separate, as in *Angiopteris*.

An interesting feature is disclosed by estimates of the potential spore-production of the single average sporangium in the four genera; the results in round numbers are, in *Angiopteris* 1,450, in *Danæa* 1,750, in *Marattia* 2,500, in *Kaulfussia* 7,850. It is to be remembered that the usual numbers in Leptosporangiate ferns are 48—64; in some Leptosporangiate ferns (*Osmunda*) the number may rise to 500. I have ascertained in *Gleichenia*, however, that the number may be as high as in *Angiopteris*. This large potential output of spores goes parallel with the broad base of the sporangia; in fact, the Eusporangiate condition is that best adapted for maturing large numbers of spores in the individual loculus.

Frequent deviations from the type have, however, been observed, as well as variations of size and mode of segmentation of the sporangia, and it is not possible in certain cases to refer the whole sporogenous tissue of one sporangium to a single parent cell. A special study of the irregularities has been made in *Danæa*, in which genus they are most marked; incomplete septa are frequent, and the sporangia are of very unequal size. The main features have already been noted in the preliminary statement on that genus, where it has been pointed out that comparison of the details with those of the septate anthers of some Angiosperms shows that there is a remarkable resemblance between the two cases. Similar irregularities have been noted, though less commonly, in *Kaulfussia*, and *Marattia*, and rarely in *Angiopteris*.

Those fossil Marattiaceæ which are best known as to the details of the sorus have been compared, and the substantial similarity of the sori in certain cases to those of the modern genera recognised. The facts from fossils and from the modern Marattiaceæ have been made the basis for a fresh discussion of the theoretical question, whether the synangium is or is not a result of coalescence of sporangia? It is concluded that the palæophytological evidence leaves the question open as to the priority of existence of forms with synangia, or with separate sporangia, in the Marattiaceæ. Notwithstanding that writers of authority have treated the question as decided, that the synangia are a result of fusion of distinct sporangia, it is held with some persistence that it is still open; the palæophytological evidence is inconclusive, while the comparative evidence from the living

genera will not only accord with, but appears actually to support a view of septation.

For the analogy with septate anthers, where septation must have occurred, and the similarity between the details of these and those in *Danæa*, and especially the partial septations in both, make it appear probable that in this genus progressive septation has taken place. It is thought probable that progressive septation has been a feature, at least where the sori are elongated, as in *Danæa*. But the question is left over for future discussion whether or not a similar septation, rather than coalescence, may be accountable also for the origin in the first instance of a circular sorus with a plurality of sporangia united together as in *Asterotheca*, or in *Pecopteris unita*.

"On the Development of Marsupial and other Tubular Enamels, with Notes upon the Development of Enamel in General." By CHARLES S. TOMES, M.A., F.R.S. Received July 12, 1897.

(Abstract.)

It was pointed out by my father, the late Sir John Tomes, that the enamel of marsupials was peculiar in that in the whole class, with the solitary exception of the Wombat, the enamel is freely penetrated by tubes which enter it from the dentine, and are continuous with the dentinal tubes at the junction of the two tissues. This character is met with sporadically in other mammals—for example, in the Jerboa among rodents, in the Shrew among insectivora, and notably in the Hyrax, in which animal the free penetration makes its enamel look quite like that of a marsupial.

Whilst there is a large literature upon the development of ordinary enamel, little or nothing has been written about that of tubular enamels.

The outermost portion of marsupial enamel is always devoid of tubes, and the extent to which the tube system exists varies greatly in different members of the group, so that the same enamel organ is obviously capable of forming either tubular enamel or enamel with solid prisms. Moreover, the sporadic reappearance of tubular enamels amongst mammals who have for the most part lost this character, and its occasional occurrence in a rudimentary condition as an abnormality in man, point to its not originating in any manner fundamentally different from that of ordinary enamel development; and it is claimed that the study of its development in marsupials affords the clue to the real nature of enamel development in all animals.